

**Patent Application**

5

of

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for

## Computerized Reward System For Encouraging Participation In A Health Management Program

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## RELATED APPLICATIONS

This application is a continuation in part of application Ser. No. 08/771,951 filed 12/23/96. This application is also related to concurrently filed application<sup>v</sup> titled "Multi-User Remote Health Monitoring System". The above named applications are herein incorporated by reference.

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## FIELD OF THE INVENTION

20 The present invention relates generally to remote monitoring systems, and in particular to a computerized reward system for encouraging participation in a health management program.

## BACKGROUND OF THE INVENTION

25 In recent years, an increasing number of healthcare providers have initiated outpatient or health management programs for their patients. The potential benefits of these home-based self-care programs are particularly great for chronically ill patients, such as those suffering from diabetes or asthma,  
30 who must treat their diseases on a daily basis. However, the success of these home self-care programs is currently limited by each patient's initiative and motivation to comply with a prescribed treatment plan for his or her disease.

The most common reason a patient fails to comply with a treatment plan is a lack of motivation to treat the disease when the disease is not causing an immediately recognizable effect. The expected effect of most diseases is pain or  
5 discomfort, and once the pain or discomfort stop, many patients ignore the disease. Of course, most healthcare issues can be addressed more effectively through prevention. The challenge is in communicating the preventative concept to a patient in such a way that he or she will be motivated and  
10 encouraged to comply with a prescribed treatment plan.

A patient's lack of motivation to comply with a treatment plan also limits the ability of a healthcare provider to aid the patient in treating his or her disease. Many treatment  
15 plans require daily monitoring of a physiological condition of the patient, such as blood glucose concentration in diabetes, peak flow rates in asthma, and blood pressure in hypertension. Since the patients themselves monitor their conditions in outpatient programs, the healthcare provider is  
20 often limited to learning each patient's status strictly through patient-initiated events, whether an emergency visit or a phone call to tell the provider the patient's latest medical data. Even with the current availability of remote monitoring devices that store and transmit medical data from  
25 a patient's home to a medical clinic, the provider must still wait for medical information whose arrival depends on the patient's initiative.

As a result, the majority of the provider's time when caring  
30 for patients with chronic medical conditions is spent with the patients who are the most motivated and eager for treatment, while the greatest medical needs remain with the less motivated patients who do not visit the provider or transmit their medical data. These less motivated patients  
35 often develop urgent medical needs that could have been

prevented with proper compliance with their prescribed treatment regimens. Consequently, the cost of treating their diseases is much higher than one might expect given the sophistication of current medical monitoring devices.

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Interactive home healthcare monitoring systems are described in U.S. Patent Nos. 5,390,238 issued to Kirk et al. on February 14, 1995, 5,434,611 issued to Tamura on July 18, 1995, and 5,441,047 issued to David et al. on August 15, 10 1995. One disadvantage of these systems is that they either require a patient to call in to a central facility to be monitored or require the central facility to call the patient according to a rigid monitoring schedule. In addition, these monitoring systems do not provide a patient with any 15 incentives. As such, it is unlikely a patient will make use of them regularly.

U.S. Patent No. 5,488,423 by Walkingshaw describes a home communication apparatus which prints out rewards or coupons 20 in consumer categories which the user prefers. U.S. Patent No. 5,502,636 by Clarke describes a personalized coupon generating and processing system which gives users coupons based on their consumer profiles. U.S. Patent No. 5,504,519 by Remillard describes a method and apparatus for printing 25 coupons which allows a user to select the coupons or other printed information he or she wants. The chosen coupons or information are printed at a central facility and then sent to the user. These inventions do not include any sort of health management program as the reason for receiving the 30 coupons, however.

Home-based computerized reward systems are also described in U.S. Patent Nos. 5,034,807, 5,128,752, 5,227,874, and 35 5,249,044 by Von Kohorn. These inventions taken together describe a system and method for evaluating a user's

responses to broadcast programs. The programs are broadcast to a wide, undefined audience of users. Users can then enter in their responses to the broadcast programs via a keyboard or other response transmitting device. The user's responses 5 are then transmitted to the response receiving station. A reward, such as a coupon, can be printed for the user from a printer located in the user's home.

This invention does not teach the modification of health-related behavior. Even in combination with health monitoring systems, this invention cannot be effectively used for healthcare programs because it is not individualized for different patients having different diseases or conditions. One broadcast program is sent at one time to all users who 10 have the ability to receive the program. Thus a user who has diabetes would receive the same broadcast program as a user who needs to lose weight. In addition, the broadcast programs are difficult to customize to the individual viewer. For example, one diabetes program would be shown to all 15 diabetics, without regard to their different needs. Although a number of broadcast programs could be created in order to accommodate all possible users, it would be prohibitively expensive and unwieldy. It would be much more efficient to have a dynamic program which could be adjusted for each 20 particular user. Finally, in this invention, the transmitting station determines when the programs are broadcast, which is inconvenient to the user. It is much 25 more convenient for the user to be able to view and/or hear a program when he or she wants.

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#### **OBJECTS AND ADVANTAGES OF THE INVENTION**

In view of the above, it is an object of the present invention to provide a computerized reward system for encouraging an individual to participate in a customized 35 health management program. It is another object of the

present invention to provide a computerized reward system for encouraging an individual to participate in a customized health management program. Another object of the present invention is to provide an individual with a remote apparatus 5 for use in a customized health management program which offers a reward. Another object of the present invention is to provide an individual with a DTMF telephone for use in a customized health management program which offers a reward. Another object of the present invention is to provide an 10 individual with a multimedia processor for use in a customized health management program which offers a reward. A further object of the present invention is to provide an individual with a data card for use in a customized health management program which offers a reward.

15 These and other objects and advantages will become more apparent after consideration of the ensuing description and the accompanying drawings.

20 **SUMMARY**  
The present invention is a computerized reward system for encouraging participation in a health management program. The system comprises a monitoring means for collecting compliance data on an individual participating in the health 25 management program, memory means for storing the compliance data, evaluation means for comparing the compliance data with evaluation criteria to determine whether or not the individual is compliant, and a reward to be given to the individual who is deemed compliant.

30 The system includes a script generator for generating a customized script for each individual participating in the health management program. The system also includes a script assignor for assigning the customized script to the 35 individual. The system further includes a database for

storing the customized script programs and the script assignments.

The memory means of the system includes compliance  
5 instructions, which include a description of at least one  
action the individual must perform in order to satisfy the  
evaluation criteria.

The individual participates in the health management program  
10 by use of a remotely programmable apparatus. The apparatus  
has a display screen to display compliance questions to the  
individual. The apparatus also has push buttons or a speech  
synthesizer with which the individual can enter in answers to  
the questions. The apparatus connects to the health  
15 monitoring server by a communication means, such as a  
telephone network or the Internet. The apparatus also  
contains device jacks to connect the apparatus to a printer  
and a monitoring device, such as a blood glucose meter.

20 In another embodiment, the computerized reward system  
comprises a interactive telephone call, whereby the  
individual is asked and answers compliance questions over the  
telephone. In another embodiment, the computerized reward  
system includes an educational program which the individual  
25 views or hears. The individual then responds to the  
educational program. For all embodiments, the individual's  
responses and compliance status can be stored in a database.

The reward given to the compliant individual can be a coupon,  
30 an electronic reward credited to a data card, or an  
electronic reward credited to the individual's account at a  
participating financial institution or retail account.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a block diagram of the networked system according to the preferred embodiment of the present invention.

5 Fig. 2 is a block diagram illustrating the interaction of the components of the system of Fig. 1.

Fig. 3 is a perspective view of a remotely programmable apparatus of the system of Fig. 1.

10 Fig. 4 is a block diagram illustrating the components of the apparatus of Fig. 3.

Fig. 5A is a script entry screen according to the preferred embodiment of the present invention.

Fig. 5B is a continuation of the script entry screen of Fig. 5A.

15 Fig. 6A is a listing of a sample script program according to the preferred embodiment of the present invention.

Fig. 6B is a continuation of the listing of Fig. 6A.

Fig. 7 is a sample script assignment screen according to the preferred embodiment of the invention.

20 Fig. 8 is a sample question appearing on the display of the apparatus of Fig. 3.

Fig. 9 is a sample prompt appearing on the display of the apparatus of Fig. 3.

25 Fig. 10 is a sample congratulatory message appearing on the display of the apparatus of Fig. 3.

Fig. 11 is a sample instruction appearing on the display of the apparatus of Fig. 3.

30 Fig. 12 is a sample coupon printed by the present invention.

Fig. 13 is a sample report displayed on the workstation of Fig. 1.

Fig. 14A is a flow chart illustrating the steps included in the monitoring application executed by the server

CONTINUATION SHEET

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of Fig. 1 according to the preferred embodiment of the present invention.

Fig. 14B is a continuation of the flow chart of Fig. 14A.

Fig. 15A is a flow chart illustrating the steps included in the script program of Figs. 14A and 14B.

Fig. 15B is a continuation of the flow chart of Fig. 15A.

Fig. 15C is a continuation of the flow chart of Fig. 15B.

Fig. 16 is a perspective view of the remotely programmable apparatus according to the second embodiment of the present invention.

Fig. 17 is a sample message appearing on the display of Fig. 3.

Fig. 18 is a sample pre-printed coupon to be validated using the present invention.

Fig. 19 is a block diagram illustrating the components of the apparatus of Fig. 16.

Fig. 20 is a block diagram of the networked system according to the third embodiment of the present invention.

Fig. 21 is a block diagram illustrating the interaction of the components of the system of Fig. 20.

Fig. 22 is a block diagram illustrating the components of the multimedia processor of Fig. 20.

Fig. 23 is a plan specification screen used in the system of Fig. 20.

Fig. 24 is a plan assignment screen used in the system of Fig. 20.

Fig. 25 is a sample compliance questionnaire used in the system of Fig. 20.

Fig. 26A is a flow chart illustrating the steps included in the monitoring application executed by the server of Fig. 20 according to the preferred embodiment of the present invention.

Fig. 26B is a continuation of the flow chart of Fig. 26A.

Fig. 27 is a block diagram of the networked system according to the fourth embodiment of the invention.

5 Fig. 28 is a plan specification screen used in the system of Fig. 27.

Fig. 29A is a flow chart illustrating the steps included in the monitoring application executed by the server of Fig. 28 according to the preferred embodiment of the present invention.

10 Fig. 29B is a continuation of the flow chart of Fig. 29A.

Fig. 30 is a block diagram illustrating the fifth embodiment of the present invention.

Fig. 31 is a flow chart illustrating the steps included in the script program of Fig. 30.

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#### DETAILED DESCRIPTION

The present invention is a computerized reward system for encouraging an individual to participate in a health management program. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one of ordinary skill in the art that these specific details need not be used to practice the invention. In addition, this invention is described for as a home healthcare monitoring system. However, it can also be used as any sort of customized monitoring system.

Figs. 1 - 15 shows the preferred embodiment of the computerized reward system. As shown in Fig. 1, networked system 40 includes a server 42, a workstation 44, and at least one patient station 47. It will be apparent to one skilled in the art that server 42 may comprise a single, stand-alone computer or multiple computers distributed throughout a network. Workstation 44 can be any computer or network computer or means of viewing web-based programs

residing on server 42. Server 42, workstation 44, and patient station 47 are connected by a communication network 46. Communication network 46 can be any means which allows information to be passed from one device to another, such as 5 a telephone network, a cellular network, a wireless network, or the Internet.

Patient station 47 comprises a remote apparatus 48, a coupon printer 54, and, optionally, a monitoring device 50. Remote 10 apparatus 48 is designed to interact with an individual in accordance with a script program sent from server 42. Remote apparatus 48 can display compliance questions sent from the server 42 to an individual, receive responses to the compliance questions, and send them back to server 42 to be 15 evaluated. Remote apparatus 48 has a printer jack for connecting to printer 54. In an alternative embodiment, printer 54 can be integrated into remote apparatus 48. Remote apparatus 48 can thus send information from server 52 to printer 54 to be printed for the individual. Remote 20 apparatus 48 also has a device jack which allows it to upload information, such as a individual's physiological measurements from a monitoring device, and send the information to server 42. Remote apparatus 48 is described in more detail below and in Figs. 3 and 4.

Coupon printer 54 is designed to print coupons if the individual is deemed compliant by the health management program. Coupon printer can be any sort of printer, such as 25 a calculator or cashier tape printer, a thermal printer, or a laser printer. The type of printer used is dependent on the type of coupon to be printed out by system 40. For example, a coupon which consists of an alphanumeric code can be printed out by a cashier type printer, while a coupon which has a bar code or a graphic is likely to be printed out by a

laser printer. Coupon printer 54 communicates with remote apparatus 48 by a standard connection cable 56.

A monitoring device 50 can also be attached to remote apparatus 48. Monitoring device 50 is designed to produce measurements of a physiological condition of the individual, record the measurements, and transmit the measurements to remote apparatus 48 through a standard connection means 52. The measurements can be used as compliance data. Examples of suitable monitoring devices include blood glucose meters, respiratory flow meters, blood pressure cuffs, electronic weight scales, and pulse rate monitors. Such monitoring devices are well known in the art. The specific type of monitoring device provided to each individual is dependent upon the individual's disease. For example, diabetic individuals are provided with blood glucose meters for measuring blood glucose concentrations, asthmatic individuals are provided with respiratory flow meters for measuring peak flow rates, overweight individuals are provided with weight scales, etc.

Although Fig. 1 shows remote apparatus 48, coupon printer 54, and monitoring device 50 as three separate components, they can be placed in the same housing. In addition, only two patient stations 47 are shown, but it is to be understood that system 40 can include any number of patient stations 47 for any number of individuals.

Fig. 2 shows server 42, workstation 44, and remote apparatus 48 in greater detail. Server 42 includes a database 58 for storing customized health management script programs 60. Customized health management script programs 60 are executed by remote apparatus 48 to communicate compliance questions to the individual, receive answers 62 to the questions, collect monitoring device measurements 64, and transmit answers 62

and measurements 64 to server 42. Database 58 is also designed to store responses 62 and measurements 64. Database 58 further includes a look-up table 66. Table 66 contains a list of the individuals participating in the health management program, and for each individual, a unique identification code and a respective pointer to customized health management script programs 60 assigned to the individual. Each remote apparatus 48 is designed to execute assigned customized health management script programs 60 which it receives from server 42.

Figs. 3 and 4 show the structure of each remote apparatus 48 according to the preferred embodiment. Referring to Fig. 3, remote apparatus 48 includes a housing 84. Housing 84 is preferably sufficiently compact to enable apparatus 48 to be hand-held and carried by an individual, but can also be a fixed device such as a television set top. Remote apparatus 48 also includes a display 86 for displaying compliance questions and prompts to the individual. In the preferred embodiment, display 86 is a liquid crystal display (LCD). In an alternative embodiment, display 86 is a television set.

Four user input buttons 90A, 90B, 90C, and 90D are located adjacent display 86. User input buttons 90A, 90B, 90C, and 90D are for entering in remote apparatus 48 responses to the compliance questions and prompts. In the preferred embodiment, user input buttons 90A, 90B, 90C, and 90D are momentary contact push buttons. In alternative embodiments, user input buttons 90A, 90B, 90C, and 90D may be replaced by switches, keys, a touch sensitive display screen, a remote control unit, or any other data input device.

A monitoring device jack 94 is located on a surface of housing 48. Monitoring device jack 94 is for connecting remote apparatus 48 to a number of monitoring devices, such

as blood glucose meters, respiratory flow meters, or blood pressure cuffs, through respective connection cables (not shown). Remote apparatus **48** also includes a modem jack **96** for connecting remote apparatus **48** to a telephone jack 5 through a standard connection cord (not shown). Remote apparatus **48** also includes a printer jack **92** for connecting remote apparatus **48** to a printer through a standard connection cord (not shown). Remote apparatus **48** further includes a visual indicator, such as a light emitting diode (LED) **88**. LED **8** is for visually notifying the individual 10 that he or she has unanswered compliance questions stored in apparatus **48**.

Fig. **4** is a schematic block diagram illustrating the 15 components of remote apparatus **48** in greater detail. Remote apparatus **48** includes a processor **98**, and a memory **100** connected to processor **98**. Memory **100** is preferably a non-volatile memory, such as a serial EEPROM. Memory **100** stores customized compliance script programs **60** received from server 20 **42**, measurements **64** received from monitoring device **50**, the individual's answers **62** to compliance questions, and the individual's unique identification code. Processor **98** also includes built-in read only memory (ROM) which stores firmware for controlling the operation of remote apparatus 25 **48**. The firmware includes a script interpreter used by processor **98** to execute customized health management script programs **60**. The script interpreter interprets script commands which are executed by processor **98**. Specific techniques for interpreting and executing script commands in 30 this manner are well known in the art.

Processor **98** is preferably connected to memory **100** using a standard two-wire I<sup>2</sup>C interface. Processor **98** is also connected to user input buttons **90A**, **90B**, **90C**, and **90D**, LED 35 **88**, a clock **112**, and a display driver **86**. Clock **112**

indicates the current date and time to processor 98. For clarity of illustration, clock 112 is shown as a separate component, but is preferably built into processor 98. Display driver 86 operates under the control of processor 98 to display information on display 86.

Modem 102 is connected to a telephone jack 104 through modem jack 96. Modem 102 is for exchanging data with server 42 through communication network 46. The data includes customized health management script programs 60 which are received from server 42 as well as answers 62 to compliance questions, device measurements 64, script identification codes, and the individual's unique identification code which modem 102 transmits to server 42. Modem 102 is preferably a complete 28.8 K modem commercially available from Cermetek, although any suitable modem may be used. In addition, other communication means such as wireless, cellular, or cable modems, etc. may also be used.

Device interface 108 is connected to device jack 94. Device interface 108 is for interfacing with a number of monitoring devices, such as blood glucose meters, respiratory flow meters, blood pressure cuffs, weight scales, or pulse rate monitors, through device jack 94. Device interface 108 operates under the control of processor 98 to collect measurements 64 from monitoring device 50, and to output measurements 64 to processor 98 for storage in memory 100. In the preferred embodiment, device interface 108 is a standard RS232 interface. For simplicity of illustration, only one device interface 108 is shown in Fig. 4. However, in alternative embodiments, remote apparatus 48 may include multiple device interfaces to accommodate monitoring devices which have different connection standards. In addition, monitoring devices can be integrated in the same housing as remote apparatus 48.

Printer interface **110** is connected to printer jack **92**.  
Printer interface **110** is for interfacing with printer **54**.  
Printer interface **110** operates under the control of processor  
5 **98**, which receives printing commands from server **42** to be  
sent to printer **54**. In the preferred embodiment, printer  
interface **110** is a standard RS232 interface. For simplicity  
of illustration, only one printer interface **110** is shown in  
Fig. 4. However, in alternative embodiments, apparatus **48**  
10 may include multiple printer interfaces to accommodate  
printers which have different connection standards.

Referring again to Fig. 2, server **42** includes a monitoring  
application **68**. Monitoring application **68** is a controlling  
15 software application executed by server **42** to perform the  
various functions described below. Monitoring application **68**  
includes a script generator **70**, a script assignor **72**, and a  
report generator **74**. Script generator **70** is designed to  
generate customized health management script programs **60** from  
20 script information entered through workstation **44**. The  
script information is entered through a script entry screen  
**76**. In the preferred embodiment, script entry screen **76** is  
implemented as a web page on server **42**. Workstation **44**  
includes a web browser for accessing the web page to enter  
25 the script information.

Figs. **5A** and **5B** illustrate script entry screen **76** as it  
appears on workstation **44**. As shown in Fig. **5A**, script entry  
screen **76** includes a script name field **116** for specifying the  
30 name of a customized health management script program to be  
generated. Script entry screen **76** also includes entry fields  
**118** for entering compliance questions to be answered by the  
individual. Each entry field **118** has corresponding response  
choice fields **120** for entering response choices for the  
35 question. A NEXT PAGE button **122** is used to continue down

script entry screen 76. Obviously, if script entry screen 76 can fit on a single display, NEXT PAGE button 122 is unnecessary.

5 As shown in Fig. 5B, script entry screen 76 further includes check boxes 124 for selecting a desired monitoring device 50 from which to collect measurements 64, such as a blood glucose meter, respiratory flow meter, or blood pressure cuff. Script entry screen 76 also displays evaluation  
10 criteria. Each evaluation criterion has a check box 126 which can be selected. More than one evaluation criterion can be selected for each customized health management script program 60. Each evaluation criterion also has a value entry field 128 where the value the individual needs to meet for  
15 each criterion can be manually entered. For example, if an individual only needs to answer the compliance questions in order to receive a coupon, the value COMPLETED can be entered into the MINIMUM QUESTION SCORE value entry field 128. In addition, value entry fields 128 allow the administrator to  
20 set a range of criteria which the individual should meet. For example, if the individual should keep his or her blood glucose level between 60-320 mg/dL, 60 mg/dL and 320 mg/dL can be entered into value entry fields 128 corresponding to MINIMUM MEASUREMENT VALUE and MAXIMUM MEASUREMENT VALUE,  
25 respectively.

Script entry screen 76 also includes check boxes 130 for selecting the type of coupon to be delivered to the individual if he or she satisfies the evaluation criteria.  
30 Ideally, the coupon type will correspond to the type of health management script program 60 assigned to the individual. For example, if the individual is a diabetic, he or she can receive a coupon for a sugar-free frozen yogurt, to be redeemed at participating retailers.

Script entry screen 76 additionally includes a connection time field 132 for specifying a prescribed connection time at which remote apparatus 48 executing customized health management script program 60 is to establish a subsequent 5 communication link to server 42. The connection time is preferably selected to be the time at which communication rates are the lowest, such as 3:00 AM. Script entry screen 76 has a monitor interval time field 140 for specifying how often the individual should be monitored. Script entry 10 screen 76 also includes a CREATE SCRIPT button 136 for instructing the script generator to generate customized health management script program 60 from the information entered in screen 76. Screen 76 further includes a CANCEL button 138 for canceling the information entered in screen 15 76. A last feature of script entry screen 76 is a PREVIOUS PAGE button 140 which is used to go back to the first part of script entry screen, as shown in Fig. 5A.

In the preferred embodiment, each customized health 20 management script program 60 created by script generator 70 conforms to the standard file format used on UNIX systems. In the standard file format, each command is listed in the upper case and followed by a colon. Every line in the script program is terminated by a linefeed character {LF}, and only 25 one command is placed on each line. The last character in the script program is a UNIX end of file character {EOF}. TABLE 1 shows an exemplary listing of script commands used in the preferred embodiment of the invention.

30  
FT, O 180  
**TABLE 1 - SCRIPT COMMANDS**

Command	Description
CLS: {LF}	Clear the display.
ZAP: {LF}	Erase from memory the last set of question responses recorded.

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LED: b{LF}	Turn the LED on or off, where b is a binary digit of 0 or 1. An argument of 1 turns on the LED, and an argument of 0 turns off the LED.
DISPLAY: {chars}{LF}	Display the text following the DISPLAY command.
INPUT: mmmm{LF}	Record a button press. The m's represent a button mask pattern for each of the four input buttons. Each m contains an "X" for disallowed buttons or an "O" for allowed buttons. For example, INPUT: OOXO{LF} allows the user to press either button #1 or #3.
WAIT: {LF}	Wait for any one button to be pressed, then continue executing the script program.
COLLECT: device{LF}	Collect measurements from the monitoring device specified in the COLLECT command. The user is preferably prompted to connect the specified monitoring device to the apparatus and press a button to continue.
NUMBER: aaaa{LF}	Assign a script identification code to the script program. The script identification code from the most recently executed NUMBER statement is subsequently transmitted to the server along with the question responses and device measurements. The script identification code identifies to the server which script program was most recently executed by the remote apparatus.
DELAY: t {LF}	Wait until time t specified in the DELAY command, usually the prescribed connection time.
CONNECT: {LF}	Perform a connection routine to establish a communication link to the server, transmit the patient identification code, question responses, device measurements, and script identification code to the server, and receive and store a new script program. When the server instructs the apparatus to disconnect, the script interpreter is restarted, allowing the new script program to execute.
PRINT: {LF}	Command printer to print information sent from server if individual has met evaluation criteria.

The script commands illustrated in TABLE 1 are representative of the preferred embodiment and are not intended to limit the scope of the invention. After

consideration of the ensuing description, it will be apparent to one skilled in the art that many other suitable scripting languages and sets of script commands may be used to implement the invention.

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Script generator 70 preferably stores a script program template which it uses to create each customized health management script program 60. To generate customized health management script program 60, script generator 70 inserts 10 into the template the script information entered in script entry screen 76. For example, Figs. 6A and 6B illustrate a sample customized health management script program 60 created by script generator 70 from the script information shown in Figs. 5A and 5B.

15

Customized health management script program 60 includes display commands to display the compliance questions and response choices entered in fields 118 and 120, respectively. Customized health management script program 60 20 also includes input commands to receive answers 62 to the compliance questions. Customized health management script program 60 further includes a collect command to collect device measurements 64 from monitoring device 50 specified in check boxes 124. Customized health management script program 25 60 also includes commands to set the evaluation criteria according to the information entered into screen 76. Customized health management script program 60 also includes commands to establish a subsequent communication link to server 42 at the connection time specified in field 132. 30 Finally, customized compliance script program 60 has a print command, which commands printer 54 to print a coupon if the individual has met the evaluation criteria as specified in script entry screen 76. The steps included in customized health management script program 60 are also shown in the

flow chart of Figs. 15A - 15C, and will be discussed in the operation section below.

Referring again to Fig. 2, script assignor 72 is for 5 assigning customized health management script program 60 to individuals. Customized health management script program 60 are assigned in accordance with script assignment information entered through workstation 44. The script assignment information is entered through a script assignment screen 78 10 which is preferably implemented as a web page on server 42.

Fig. 7 illustrates a sample script assignment screen 78 as it appears on workstation 44. Screen 78 includes check boxes 142 for selecting customized health management script program 60 to be assigned and check boxes 144 for selecting the individuals to whom health management compliance script program 60 is to be assigned. Screen 78 also includes an ASSIGN SCRIPT button 148 for entering the assignments. When button 148 is pressed, the script assignor creates and stores 20 for each individual selected in check boxes 144 a respective pointer to customized health management script program 60 selected in check boxes 142. Each pointer is stored in look-up table 66 of database 58. Screen 78 further includes an ADD SCRIPT button 146 for accessing the script entry screen 25 to create a new customized health management script program 60, and a DELETE SCRIPT button 150 for deleting a customized health management script program 60.

Referring again to Fig. 2, report generator 74 is designed to 30 generate an individual's compliance report 80 from responses 62 and device measurements 64 received in server 42. Report 80 is displayed on workstation 44. Fig. 13 shows a sample report 80 produced by report generator 74 for a selected individual. Report 74 includes a graph 160 of device 35 measurements 64 received from the individual, as well as a

listing of answers **62** received from the individual. Report **74** also includes a status field **162**, which indicates the compliance status of the individual. Specific techniques for writing a report generator program to display data in this  
5 manner are well known in the art.

Fig. **2** also shows coupon printer **54** which has coupons **82**. When coupon printer **54** receives the print command and the information to be printed from server **42** via remote apparatus  
10 **48**, it prints out coupon **82**. Coupon printer **54** will only receive the print command and print information if it has been determined that the individual has fulfilled the evaluation criteria. Sample coupon **82** is shown in Fig. **12**. In the preferred embodiment, coupon **82** has an information  
15 field **154**, which tells the individual what he or she has just received. Coupon **82** also has a validation time field **152**, which tells the individual the time period during which he or she can redeem coupon **82**. Bar code **156** is a UPC code, while bar code **158** is a household code, which identifies the  
20 individual. Bar code **156** is scanned by the retailer when the individual redeems coupon **82** in order to determine the individual's discount. The methods of creating, printing, and scanning bar codes are well known.

25 An alternative coupon **168** is shown in Fig. **18**. Coupon **168** also has information field **154**, validation time field **152**, and bar codes **156** and **158**, all of which have the same purpose as in coupon **82**. The difference between coupon **82** and coupon **168** is that coupon **168** is preprinted with all of  
30 the above features. Preprinted coupons **168** are given to the individual. The individual loads coupons **168** into printer **54**. After the individual completes the health management program, printer **54** then prints valid identification field **170** on coupons **168**. Valid identification field **170**

validates coupons **168** and allows the individual to redeem them.

Fig. **14A** is a flow chart illustrating steps included in the monitoring application executed by server **42**. Fig. **14B** is a continuation of the flow chart of Fig. **14A**. In step **302**, server **42** determines if new script information has been entered through script entry screen **76**. If new script information has not been entered, server **42** proceeds to step **306**. If new script information has been entered, server **42** proceeds to step **304**.

As shown in Figs. **5A** and **5B**, the script information includes compliance questions, and for each of the compliance questions, corresponding responses choices. The script information also includes selected monitoring device type **50** from which to collect device measurements **64**. The script information further includes a prescribed connection time for each remote apparatus **48** to establish a subsequent communication link to server **42**. The script information is generally entered in server **42** by an administrator, such as an individual's healthcare provider. Of course, any person desiring to communicate with the patients may also be granted access to server **42** to create and assign customized compliance script programs **60**. Further, it is to be understood that system **40** may include any number of workstations **44** for entering script generation and script assignment information in server **42**.

In step **304**, script generator **70** generates customized health management script program **60** from the information entered in screen **76**. Customized health management script program **60** is stored in database **58**. Steps **302** and **304** are preferably repeated to generate multiple customized health management script programs **60**, e.g. a customized health management

script program **60** for diabetic individuals, a customized health management script program **60** for asthmatic individuals, etc. Each customized health management script program **60** corresponds to a respective one of the sets of 5 compliance questions entered through script entry screen **76**. Following step **304**, server **42** proceeds to step **306**.

In step **306**, server **42** determines if new script assignment information has been entered through assignment screen **78**.  
10 If new script assignment information has not been entered, server **42** proceeds to step **310**. If new script assignment information has been entered, server **32** proceeds to step **308**. As shown in Fig. 7, customized health management script programs **60** are assigned to each individual by selecting 15 customized health management script program **60** through check boxes **142**, selecting the individuals to whom selected customized health management script program **60** is to be assigned through check boxes **144**, and pressing ASSIGN SCRIPT button **148**. When ASSIGN SCRIPT button **148** is pressed, 20 script assignor **78** creates for each individual selected in check boxes **144** a respective pointer to customized health management script program **60** selected in check boxes **142**. In step **308**, each pointer is stored in look-up table **66** of database **58**. Following step **308**, server **42** proceeds to step 25 **310**.

In step **310**, server **42** determines if any remote apparatuses **48** are connected to server **42**. Each individual to be monitored is preferably provided with his or her own remote 30 apparatus **48** which has the individual's unique identification code stored therein. Each individual is thus uniquely associated with a respective one of remote apparatuses **48**. If none of remote apparatuses **48** are connected, server **42** proceeds to step **320**.

If remote apparatus 48 is connected, server 42 receives from remote apparatus 48 the individual's unique identification code in step 312. In step 314, server 42 receives from remote apparatus 48 compliance answers 62, device measurements 64, and script identification code recorded during execution of a previously assigned customized health management script program 60. The script identification code identifies to server 42 which customized health management script program 60 was executed by remote apparatus 48 to record compliance answers 62 and device measurements 64. Compliance answers 62, device measurements 64, and script identification code are stored in database 58.

In step 316, server 42 uses the individual's identification code to retrieve from look-up table 66 the pointer to customized health management script program 60 assigned to the individual. Server 42 then retrieves customized health management script program 60 from database 58. In step 318, server 42 transmits customized health management script program 60 to the individual's remote apparatus 48 through communication network 46. Following step 318, server 42 proceeds to step 320.

In step 320, server 42 determines if a report request has been received from workstation 44. If no report request has been received, server 42 returns to step 302. If a report request has been received for a selected individual, server 42 retrieves from database 58 compliance answers 62 and device measurements 64 last received from the individual, as shown in step 322. In step 324, server 42 generates and displays report 80 on workstation 44. As shown in Fig. 13, report 80 includes compliance answers 62 and device measurements 64 last received from the individual. Following step 324, server 42 returns to step 302.

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Figs. 15A - 15C illustrate the steps included in customized health management script program 60 executed by remote apparatus 48. Before customized health management script program 60 is received, remote apparatus 48 is initially programmed with the individual's unique identification code and the script interpreter used by processor 98 to execute customized health management script program 60. The initial programming may be achieved during manufacture or during an initial connection to server 42. Following initial programming, remote apparatus 48 receives from server 42 customized health management script program 60 assigned to the individual associated with remote apparatus 48. Customized health management script program 60 is received by modem 102 through a first communication link and stored in memory 100.

In step 402, processor 98 assigns a script identification code to customized health management script program 60 and stores the script identification code in memory 100. The script identification code is subsequently transmitted to server 42 along with compliance question answers 62 and device measurements 64 to identify to server 42 which customized health management script program 60 was most recently executed by remote apparatus 48. In step 404, processor 98 lights LED 88 to notify the individual that he or she has unanswered compliance questions stored in remote apparatus 48. LED 88 preferably remains lit until all compliance questions are answered by the individual. In step 406, processor 98 erases from memory 100 the last set of answers 62 recorded.

In step 408, processor 98 prompts the individual by displaying on display 86 "ANSWER QUERIES NOW? PRESS ANY BUTTON TO START". In step 410, processor 98 waits until a reply to the prompt is received from the individual. When a

reply is received, processor 98 proceeds to step 412. In step 412, processor 98 executes successive display and input commands to display the compliance questions and response choices on display 86 and to receive answers 62 to the 5 compliance questions.

Fig. 8 illustrate a sample compliance question and its corresponding response choices as they appear on display 86. The response choices are positioned on display 86 such that 10 each response choice is located proximate a respective one of user input buttons 90A, 90B, 90C, and 90D. In the preferred embodiment, each response choice is displayed immediately above a respective user input button 90. The individual presses user input button 90 corresponding to his or her 15 response 62. Processor 98 stores each answer 62 in memory 100.

In steps 414 - 418, processor 98 executes commands to collect device measurements 64 from selected monitoring 20 device 50. Customized health management script program 60 specifies selected monitoring device 50 from which to collect device measurements 64. In step 414, processor 98 prompts the individual to connect selected monitoring device 50, for example a blood glucose meter, to device jack 94. A sample 25 prompt is shown in Fig. 9. In step 416, processor 98 waits until a reply to the prompt is received from the individual. When a reply is received, processor 98 proceeds to step 418. In step 418, processor 98 collects device measurements 64 from monitoring device 50 through interface 108. Device 30 measurements 64 are stored in memory 100.

In step 420, processor 98 determines whether or not the individual has met the evaluation criteria. Preferably, processor 98 sums device measurements 64 and comes up with a 35 value. In step 422, processor 98 then determines the

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maximum allowable value for the criteria. In step **424**, processor **98** determines the minimum allowable value for the criteria. In step **426**, processor compares the individual's value with the maximum and minimum allowable values. If the  
5 individual's value falls within the maximum and minimum values, processor determines that the criteria has been met and goes to step **428**. In step **428**, a congratulations message is shown on display **86** of remote apparatus **48**. A sample congratulations message is shown in Fig. **10**.  
10 Processor **98** then commands printer **54** to print coupon **82** for the compliant individual.

If the individual is not compliant and has not met the evaluation criteria, processor **98** goes to step **432**. In step  
15 **432**, processor **98** displays instructions for the individual on display **86** of remote apparatus **48**. The instructions are intended to remind the individual what he or she must do in order to be considered compliant. A sample instruction message is shown in Fig. **11**.

20 In step **434**, processor **98** prompts the individual to connect remote apparatus **48** to telephone jack **104** so that remote apparatus **48** may connect to server **42** at the prescribed connection time. In step **436**, processor **98** waits until a  
25 reply to the prompt is received from the individual. When a reply is received, processor **98** turns off LED **88** in step **438**. In step **440**, processor **98** waits until it is time to connect to server **42**. Processor **98** compares the connection time specified in customized health management script program  
30 **60** to the current time output by clock **112**. When it is time to connect, processor **98** connects to modem **102**.

In step **442**, processor **98** establishes a subsequent communication link between remote apparatus **48** and server **42** through modem **102** and communication network **46**. If the  
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connection fails for any reason, processor **98** repeats step **442** to get a successful connection. In step **446**, processor **98** transmits compliance question responses **62**, device measurements **64**, script identification code, and the individual's identification code stored in memory **100** to server **42** through the subsequent communication link. In step **448**, processor **98** receives through modem **102** new customized health management script program **60** from server **42**. New customized health management script program **60** is stored in memory **100** for subsequent execution by processor **98**. Following step **448**, customized health management script program **60** ends.

Figs. **16 - 19** illustrate a second embodiment of the invention in which each remote apparatus has speech recognition and speech synthesis functionality. Fig. **16** shows a perspective view of a remote apparatus **49** according to the second embodiment. Remote apparatus **49** includes a speaker **164** for audibly communicating compliance questions and prompts to the individual. Remote apparatus **49** also includes a microphone **166** for receiving spoken responses to the compliance questions and prompts. Remote apparatus **49** may optionally include a display **86** for displaying prompts to the individual, as shown in Fig. **17**.

Fig. **19** is a schematic block diagram illustrating the components of remote apparatus **49** in greater detail. Remote apparatus **49** is similar in design to remote apparatus **48** of the preferred embodiment except that remote apparatus **49** includes an audio processor chip **172** in place of processor **98**. Audio processor chip **172** is preferably an RSC-164 chip commercially available from Sensory Circuits Inc. of 1735 N. First Street, San Jose, California 95112.

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Audio processor chip **172** has a microcontroller **174** for executing customized health management script programs **60** received from server **48**. A memory **100** is connected to microcontroller chip **174**. Memory **100** stores customized  
5 health management script program **60**, and a script interpreter used by microcontroller chip **174** to execute customized health management script program **60**. Memory **100** also stores device measurements **64** received from monitoring device **50**, answers **62** to the compliance questions, script identification codes,  
10 and the individual's unique identification code.

Audio processor chip **172** also has built in speech synthesis functionality for synthesizing questions and prompts to a individual through speaker **164**. For speech synthesis, audio  
15 processor chip **172** includes a digital to analog converter (DAC) **192** and an amplifier **194**. DAC **192** and amplifier **194** drive speaker **164** under the control of microcontroller chip **174**.

20 Audio processor chip **172** further has built in speech recognition functionality for recognizing responses spoken into microphone **166**. Audio signals received through microphone **166** are converted to electrical signals and sent to a preamp and gain control circuit **178**. Preamp and gain  
25 control circuit **178** is controlled by an automatic gain control circuit (AGC) **186**, which is in turn controlled by microcontroller chip **174**. After being amplified by preamp **178**, the electrical signals enter microcontroller chip **174** and pass through a multiplexer **180** and an analog to digital  
30 converter (ADC) **182**. The resulting digital signals pass through a digital logic circuit **184** and enter microcontroller chip **174** for speech recognition.

35 Audio processor chip **172** also includes a RAM **188** for short term memory storage and a ROM **190** which stores customized

health management script program 60 executed by microcontroller chip 174 to perform speech recognition and speech synthesis. Audio processor chip 172 operates at a clock speed determined by a crystal 176. Audio processor 5 chip 172 also includes a clock 112 which provides the current date and time to audio processor chip 172. As in the preferred embodiment, remote apparatus 49 includes an LED 88, display driver 106, modem 102, device interface 108, and printer interface 110, all of which are connected to 10 microcontroller 174.

The operation of the second embodiment is similar to the operation of the preferred embodiment except that compliance questions, response choices, and prompts are audibly 15 communicated to the individual through speaker 164 rather than being displayed to the individual on display 86. The operation of the second embodiment also differs from the operation of the preferred embodiment in that answers 62 to the compliance questions and prompts are received through 20 microphone 166 rather than through user input buttons 90A, 90B, 90C, and 90D.

The customized compliance script programs of the second embodiment are similar to customized health management script 25 program 60 shown in Figs. 6A - 6B, except that each display command is replaced by a speech synthesis command and each input command is replaced by a speech recognition command. The speech synthesis commands are executed by microcontroller 174 to synthesize the compliance questions, response choices, 30 and prompts through speaker 164. The speech recognition commands are executed by microcontroller 174 to recognize answers 62 spoken into microphone 166.

For example, to ask an individual how he or she feels and 35 record a response, microcontroller 174 first executes a

speech synthesis command to synthesize through speaker **164** "How do you feel? Please answer with one of the following responses: very bad, bad, good, or very good." Next, microcontroller **174** executes a speech recognition command to 5 recognize the response spoken into microphone **166**. The recognized response is stored in memory **100** and subsequently transmitted to server **42**. Other than the differences described, the operation and advantages of the second embodiment are the same as the operation and advantages of 10 the preferred embodiment described above.

A third embodiment of the present invention is illustrated in Figs. **20 - 26**. This embodiment encompasses a number of features. One feature asks individuals compliance questions, 15 another feature receives device measurements **64** from device monitor **50**, and a third feature allows an administrator to select an educational program to be broadcast to the individual. The individual must satisfy the evaluation criteria for all three features in order to be considered 20 compliant. If he or she is deemed compliant, a coupon is printed out.

Fig. **20** shows the system comprising a server **42**, a workstation **44**, and an individual station **197**. All three 25 components of the system are connected via a communication network **46**. Individual station **197** comprises a multimedia processor **196** which has attached to it a display unit **198**. Display unit **198** can be any sort of device which presents audiovisual signals, such as a television. Multimedia 30 processor **196** also has attached to it monitoring device **50** and coupon printer **54**. Both monitoring device **50** and coupon printer **54** work in the same manner as described in the first embodiment.

Fig. 21 shows server 42 in greater detail. Server 42 includes a database 58 for storing health management script programs 60. Customized health management script programs 60 are executed by multimedia processor 196 to communicate 5 compliance questions to the individual, receive answers 62 to the questions, display an educational program 202, receive responses 206 to educational program 202, collect monitoring device measurements 64, and transmit answers 62 and measurements 64 to server 42. Database 58 is also designed 10 to store answers 62 and measurements 64. Database 58 further includes a look-up table 66. Table 66 contains a list of the individuals participating in the compliance program, and for each individual, a unique identification code and a respective pointer to customized health management 15 script programs 60 assigned to the individual.

Database 58 also includes plan specifications 204 for use by the administrator. Plan specifications 204 allow the administrator to design a plan for an individual. Thus plan 20 specifications 204 provide customized compliance programs for each individual. The plan specification screen 205 is shown in Fig. 23. Plan specification screen 205 includes a plan name field 116, which allows the administrator to name the plan. Plan specification screen 205 also includes fields 25 118 for compliance questions. Compliance questions can be entered by the administrator to ask the individual how he or she is faring with the compliance program.

The compliance questionnaire 198 which is generated from the 30 compliance questions entered on plan specification screen 205 is shown in Fig. 25. Compliance questionnaire 198 comprises questions about how successfully the individual has followed his or her compliance program. Compliance questionnaire 198 also comprises responses 206 to the compliance questions. 35 The individual can enter in his or her best responses 206 to

the compliance questions via multimedia processor 196. Answers 206 are then evaluated and eventually sent to server 42.

5 Referring back to Fig. 23, plan specification screen 205 also includes check boxes 124 for selecting the type of monitoring device 50 which the individual should connect to multimedia processor 196 in order to transmit device measurements 64 to server 42. Plan specification screen 205 further comprises  
10 check boxes 222 for selecting the educational program 202 for the individual to view. Educational program 202 ideally corresponds with the compliance questions and the monitoring device 50. For example, if the compliance questions are aimed at diabetic individuals and monitoring device 50 is a  
15 blood glucose meter, educational program 202 will be on diabetes.

In addition, plan specification screen 205 also displays evaluation criteria. Each evaluation criterion has a check  
20 box 126 which can be selected. More than one evaluation criterion can be selected for each customized health management script program 60. Each evaluation criterion also has a value entry field 128 where the value the individual needs to meet for each criterion can be manually entered.

25 Plan specification screen 205 also includes check boxes 130 for selecting the type of coupon to be delivered to the individual if he or she satisfies the evaluation criteria. Ideally, the coupon type will correspond to the type of  
30 health management script program 60 assigned to the individual. For example, if the individual is a diabetic, he or she can receive a coupon for a sugar-free frozen yogurt, to be redeemed at participating retailers.

The other features of plan specification screen 205 are a monitoring interval field 134 for determining how often the individual should respond to the monitoring plan, an OK button 224 which is used to save the information entered into 5 plan specification screen 205, and a CANCEL button 226 to erase the information entered into plan specification screen 205.

Referring back to Fig. 21, server 42 includes a monitoring application 200. Monitoring application 200 is a controlling software application executed by server 42 to perform the various functions described below. Monitoring application 200 includes a plan generator 71, a plan assignor 73, and a report generator 74. Plan generator 70 is 10 designed to generate plan specifications 204 from information entered through plan specification screen 205. Server 42 also includes educational programs 202 which are sent to multimedia processor 196 to be displayed on display unit 198 for the individual to view.

Fig. 22 shows a detailed block diagram of multimedia processor 196. Multimedia processor 196 is designed to execute assigned customized compliance plan specifications 204 which it receives from server 42. Multimedia processor 25 196 has a computer processing unit (CPU) 98 which is connected to a memory 100. Memory 100 is preferably a non-volatile memory, such as a serial EEPROM. Memory 100 stores customized compliance plan specifications 204 from server 42, as well as the individual's answers 62, answers 206, and 30 device measurements 64 to be sent to server 42. CPU 98 is preferably connected to memory 100 using a standard two-wire I<sup>2</sup>C interface.

CPU 98 is also connected to printer interface 110, which 35 transmits information to printer 54 through printer jack 96,

and device interface **108**, which transmits data from monitoring device **50** through device jack **94**. The data includes compliance questionnaires, educational programs, the individual's answers and responses, and coupon information to 5 be printed on printer **54**. CPU **98** is also connected to device interface **108** which connects monitoring device **50** through device jack **94**. Measurements **64** from monitoring device **50** are uploaded into CPU **98**, where they are then transmitted to server **42**. CPU **98** is further connected to modem **102**, which 10 is used to connect multimedia processor **196** to server **42** through communication network **42**. Modem **102** is connected to telephone jack **104** through modem jack **96**.

CPU **98** is also connected to a video/text generator **208**. 15 Video/text generator **208** is for receiving and processing educational programs **202** from the CPU and displaying them on display unit **198** to be viewed and heard by the individual. Alternatively, the educational programs can be received using a tuner **212**, which is also connected to CPU **98**. Tuner **212** 20 receives signals of different frequencies from a broadcast source **214**, such as the transmitter of a television station. Tuner **212** translates these signals into educational programs **202** which can be viewed and heard by the individual on display unit **198**. Both video/text generator **208** and tuner 25 **212** are connected to a CMOS switch **210**, which is also connected to CPU **98**. CMOS switch **210** alternatively connects video/text generator **208** and tuner **212** to CPU **98**.

Finally, CPU **98** is connected to a control receiver **216**. 30 Control receiver **206** is for receiving signals from a remote control **218**. Remote control **218** is a standard wireless signal producer which can be used by the individual to send commands to CPU **98** from a distance. Signals generated by remote control **218** are received by control receiver **216** and 35 sent to CPU **98** to be carried out.

Referring back to Fig. 21, workstation 44 connected to server 42 includes plan specification entry screen 205, a plan assignment screen 228, and report screen 80. Plan assignment screen 228 is illustrated in greater detail in Fig. 24. Plan assignment screen 228 comprises check boxes 230 for each of the available plans. Plan assignment screen 228 also comprises check boxes 232 for selecting the individual to whom the plan is to be assigned. After the assignment has been made, the ASSIGN PLAN button 236 is selected to create and store for the individual selected in check boxes 232 a respective pointer to the plan selected in check boxes 230. Each pointer is stored in look-up table 66 of database 58. Plan assignment screen 228 further includes an ADD PLAN button 234 for accessing plan specification screen 205 and a DELETE PLAN button 238 for deleting a plan specification.

The operation of this embodiment is shown in Figs. 26A and 26B. Fig. 26A is a flow chart illustrating steps included in the monitoring application executed by server 42. Fig. 26B is a continuation of the flow chart of Fig. 26A. In step 502, server 42 determines if new plan information has been entered through plan specification screen 205. If new plan information has not been entered, server 42 proceeds to step 506. If new script information has been entered, server 42 proceeds to step 504.

As shown in Fig. 23, plan specification screen 205 includes compliance questions, monitoring devices 50 to be selected, educational programs to be selected, evaluation criteria to be set, and coupon types to be selected. Plan specification screen 205 further includes a prescribed connection time for multimedia processor 196 to establish a subsequent communication link to server 42. The plan information is generally entered in server 42 by an administrator, such as a

healthcare provider. Of course, any person desiring to communicate with the individuals may also be granted access to server 42 to create and assign plans. Further, it is to be understood that the system may include any number of workstations 44 for entering plan generation and plan assignment information in server 42.

In step 504, plan generator 71 generates a plan specification from the information entered in plan specification screen 205. Plan specification 204 is stored in database 58. Steps 502 and 504 are preferably repeated to generate multiple plan specifications 204, e.g. plans for diabetic individuals, plans for asthmatic individuals, etc. Following step 504, server 42 proceeds to step 506.

In step 506, server 42 determines if new plan assignment information has been entered through plan assignment screen 228. If new plan assignment information has not been entered, server 42 proceeds to step 510. If new plan assignment information has been entered, server 42 proceeds to step 508. In step 508, each pointer generated on plan assignment screen 228 is stored in look-up table 66 of database 58. Following step 508, server 42 proceeds to step 510.

In step 510, server 42 determines if a report request has been received from workstation 44. If no report request has been received, server 42 goes to step 516. If a report request has been received for a selected individual, server 42 retrieves from database 58 responses 62, answers 206, and device measurements 64 last received from the individual in step 512. In step 514, server 42 generates and displays the individual's report on workstation 44. Following step 514, the server goes to step 516.

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In step 516, server 42 determines if any multimedia processors 196 are remotely connected to server 42. Each individual to be monitored is preferably provided with his or her own multimedia processor 196 which has the individual's unique identification code stored therein. Each individual is thus uniquely associated with a respective one of the multimedia processors 196. If none of the multimedia processors 196 are connected, server 42 returns to step 502.

10 If multimedia processor 196 is connected, server 42 receives from multimedia processor 196 the individual's unique identification code in step 518. In step 520, server 42 receives from multimedia processor 196 responses 62, answers 206, device measurements 64, and plan identification code recorded during execution of a previously assigned plan. The plan identification code identifies to server 42 which plan was executed by multimedia processor 196 to record answers 62, responses 206, and device measurements 64. The answers 62, responses 206, device measurements 64, and plan identification code are stored in database 58.

In step 522, server 42 uses the individual's identification code to retrieve from look-up table 66 the pointer to plan specification 204 assigned to the individual. Server 42 then retrieves assigned plan specification 204 from database 58. Server 42 transmits assigned plan specification 204 to the individual's multimedia processor 196 through communication network 46. Following step 522, server 42 proceeds to step 524.

30 In steps 524 and 526, multimedia processor 196 executes commands to collect device measurements 64 from a selected monitoring device 50. Plan specification 204 determines the selected monitoring device 50 from which to collect device 35 measurements 64. In step 524, multimedia processor 196

prompts the individual to connect selected monitoring device 50, for example a blood glucose meter, to device jack 94. In step 526, multimedia processor 196 collects device measurements 64 from monitoring device 50 through device 5 interface 108. Device measurements 64 are stored in memory 100.

In step 528, multimedia processor 196 determines whether plan specification 204 indicates educational program 202 should be shown on display 198. If not, multimedia processor 196 goes directly to step 534. If educational program 202 has been specified, multimedia processor 196 goes to step 530. In step 530, multimedia processor 196 receives the educational program via modem 102 or tuner 212. The educational program is then processed and displayed on display unit 198. In step 532, the individual uses remote control 218 to respond to educational program 202. Answers 62 are sent from multimedia processor 196 to server 42 where they are stored on database 58.

Next is step 534, where multimedia processor 196 calculates if the individual has met the evaluation criteria which determines his or her compliance status. If the individual is deemed compliant, display 198 shows a congratulations message, in step 536. An example of a congratulations message is shown in Fig. 10. Multimedia processor 196 then directs coupon printer 54 to print coupon 82 for the individual. An example of coupon 82 is shown in Fig. 12.

If the individual is deemed uncompliant, multimedia processor 196 goes to step 540 and displays instructions for the individual to follow in order to become compliant. Example instructions are shown in Fig. 11. At this time, multimedia processor 196 goes back to step 502 and repeats the sequence.

Another embodiment of the present invention is shown in Figs. 27 - 29. This system is an automated telephone monitoring system which regularly calls individuals who are 5 participating in the compliance program. Compliant patients receive credit in their own account 252 set up at a participating store 250. The system comprises a server 42, an individual station 245, and participating store 250. Individual stations 245 comprise a DTMF telephone which can 10 be connected to a monitoring device 50 by a communication means 248, such as a standard cable connection.

Fig. 27 shows a detailed block diagram of the system. Server 42 communicates with individual station 245 through a 15 digital/tone signal converter 244. The purpose of digital/tone signal converter 244 is to convert electronic signals generated by the monitoring application 240 into recognizable sounds to be heard by the individual. The electronic signals generated by monitoring application 240 20 correspond to plan specification 204 generated by plan generator 73.

Server 42 includes a database 58, which stores plan specifications 204, the individual's responses 62 to 25 compliance questions entered on plan specifications 204, device measurements 64, and a look-up table 66. Plan specifications 204 allow the administrator to design a plan for an individual. Thus plan specifications 204 provide customized compliance programs for each individual. The plan 30 specification screen 207 for this embodiment is shown in Fig. 28. Note that plan specification screen 207 of Fig. 28 is similar to plan specification screen 205 of Fig. 23. The plan name field 116, the compliance question fields 118, the check boxes 124 for selecting a monitoring device 50, the 35 check boxes 126 for selecting evaluation criteria, the

monitoring interval field **134**, the OK button **224**, and the CANCEL button **226** all have the same function as in plan specification screen **205** of Fig. **23**. However, plan specification screen **207** of Fig. **28** also has check boxes **254** for selecting reward account **252** at participating store **250**.

Referring back to Fig. **27**, monitoring application **240** includes a plan generator **71**, a plan assignor **73**, and a report generator **74**. All three components of monitoring application **240** have the same functions as their counterparts in the previous embodiments.

The operation of this embodiment is shown in Figs. **29A** and **29B**. Fig. **29A** is a flow chart illustrating steps included in monitoring application **240** executed by server **42**. Fig. **29B** is a continuation of the flow chart of Fig. **29A**. In step **602**, server **42** determines if new plan information has been entered through plan specification screen **207**. If new plan information has not been entered, server **42** proceeds to step **606**. If new script information has been entered, server **42** proceeds to step **604**.

In step **604**, plan specification **204** is generated from plan specification screen **207** and is stored in database **58**. Steps **602** and **604** are preferably repeated to generate multiple plans, e.g. plans for diabetic individuals, plans for asthmatic individuals, etc. Following step **604**, server **42** proceeds to step **606**.

In step **606**, server **42** determines if new plan assignment information has been entered through plan assignment screen **228**. Plan assignment screen **228** is the same as that used in the previously described embodiment and shown in Fig. **24**. If new plan assignment information has not been entered, server **42** proceeds to step **610**. If new plan assignment information

has been entered, server **42** proceeds to step **608**. In step **608**, each pointer generated on plan assignment screen **228** is stored in look-up table **66** of database **58**. Following step **608**, server **42** proceeds to step **610**.

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In step **610**, server **42** determines if a report request has been received from workstation **44**. If no report request has been received, server **42** goes to step **616**. If a report request has been received for a selected individual, server **42** retrieves from database **58** answers **62** and device measurements **64** last received from the individual in step **612**. In step **614**, server **42** generates and displays the individual's report on workstation **44**. Following step **614**, the server goes to step **616**.

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In step **616**, server **42** determines if it is time to call the individual, as determined by the information entered into plan specification screen **207**. If it is not time, server **42** returns to step **602**. If it is time to call, server **42** proceeds to step **618**. In step **618**, server **42** calls the individual through the use of automated call processor **242**. Compliance questions and prompts entered into plan assignment screen **207** are translated into recognizable sounds and sent via digital/tone signal converter **244** to individual's DTMF telephone **246**.

In step **620**, the individual hears the compliance questions. The individual responds to the compliance questions and answers **62** are sent back through digital/tone signal converter **244** to automated call processing **242** of server **42**. Responses **62** are then stored in database **58**.

In steps **622** and **624**, server **42** executes commands to collect device measurements **64** from a selected monitoring device **50**. Plan specification **204** determines the selected monitoring

device 50 from which to collect device measurements 64. In step 524, server 42 prompts the individual to connect selected monitoring device 50, for example a blood glucose meter, to a device jack of DTMF telephone 246 via communication link 248. Device measurements 64 are stored in database 58.

Next is step 626, where server 42 calculates if the individual has met the evaluation criteria which determines his or her compliance status. If the individual is deemed compliant, server 42 credits individual's account 252 in participating store 250 in step 630. There are a number of ways in which server 42 can credit account 252. If server 42 and account 252 are connected by a communication means, the credit can be automatically sent over. If server 42 and account 252 are not connected by a communication means, server 42 can print out a credit sheet to be sent to participating store 250, where credit can be manually entered into account 252.

If the individual is deemed uncompliant, server 42 goes to step 632 and displays instructions for the individual to follow in order to become compliant. At this time, server 42 goes back to step 602 and repeats the sequence.

A last embodiment of the present invention is shown in Figs. 30 and 31. This embodiment makes use of a memory card 258 which provides communication means between the administrator's workstation 45 and the individual's multimedia processor 197. Memory card 258 contains a magnetic strip or electronic circuit which stores information.

Fig. 30 shows a detailed block diagram of administrator workstation 45 and multimedia processor 197. Administrator

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workstation 45 comprises a database 58, which includes customized health management script programs 60, the individual's responses 62 to compliance questions in customized health management script programs 60, and device measurements 64. Monitoring application 68 is a controlling software application executed by server 42 to perform the various functions described below. Monitoring application 68 includes a script generator 70, a script assignor 72, and a report generator 74. Script generator 70 is designed to generate customized compliance script programs 60 from script information entered through workstation 44. Report generator 74 is for creating reports 80 from answers 62 and device measurements 64 to be displayed on workstation 45 for the administrator to view.

15 Workstation 45 also comprises a memory card reader/writer 256. Memory card reader/writer 256 is used by the administrator to store customized compliance script programs 60 on memory card 258. Memory card 258 is then given to the 20 individual, who takes it and places it in the memory card reader/writer 260 of his or her multimedia processor 197.

Multimedia processor 197 of this embodiment is similar to multimedia processor 196 described above. Multimedia processor 197 is designed to execute assigned customized compliance script programs 60 which it receives from workstation 45. Multimedia processor 197 has a computer processing unit (CPU) 98 which is connected to a memory 100. Memory 100 is preferably a non-volatile memory, such as a 30 serial EEPROM. Memory 100 stores customized health management script programs 60 from workstation 45, as well as the individual's answers 62, responses 206, and device measurements 64 to be sent to workstation 45. CPU 98 is preferably connected to memory 100 using a standard two-wire I<sup>2</sup>C interface. CPU 98 is also connected to device interface

108 which connects monitoring device 50 through device jack 94. Measurements 64 from monitoring device 50 are uploaded into CPU 98, where they are then transmitted to workstation 45.

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CPU 98 is further connected to a video/text generator 208. Video/text generator 208 is for receiving and processing the educational programs from the CPU and displaying them on display unit 198 to be viewed and heard by the individual.

10 Alternatively, the educational programs can be received using a tuner 212, which is also connected to CPU 98. Tuner 212 receives signals of different frequencies from a broadcast source 214, such as the transmitter of a television station. Tuner 212 translates these signals into educational programs 202 which can be viewed and heard by the individual on display unit 198. Both video/text generator 208 and tuner 212 are connected to a CMOS switch 210, which is also connected to CPU 98. CMOS switch 210 alternatively connects video/text generator 208 and tuner 212 to CPU 98.

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Finally, CPU 98 is connected to a control receiver 216. Control receiver 216 is for receiving signals from a remote control 218. Remote control 218 is a standard wireless signal producer which can be used by the individual to command CPU 98 from a distance. Signals generated by remote control 218 are received by control receiver 216 and sent to CPU 98 to be carried out.

Fig. 31 illustrates the steps carried out by customized health management script programs 60. Customized health management script program 60 begins when memory card 258 which stores customized health management script program 60 is placed in memory card reader/writer 260 of multimedia processor 197. In step 702, customized health management script program 60 first displays compliance questions on

display unit 198 for the individual to view or hear. The individual responds to the compliance questions using remote control 218. Individual's responses 62 are sent from CPU 98 to workstation 45.

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In steps 704 and 706, customized health management script program 60 commands the collection of device measurements 64 from selected monitoring device 50. Customized health management script program 60 determines the selected monitoring device 50 from which to collect device measurements 64. In step 704, customized health management script program 60 prompts the individual to connect selected monitoring device 50, for example a blood glucose meter, to a device jack 94 of multimedia processor 197. Device measurements 64 are stored in database 58 on workstation 45 in step 706.

Next is step 708, where customized health management script program 60 calculates if the individual has met the evaluation criteria which determines his or her compliance status. If the individual is deemed compliant, customized health management script program 60 displays a congratulatory message on display unit 198 of multimedia processor 197 in step 712. Customized health management script program 60 also credits individual's memory card 258 in step 714. The credit can be redeemed in a number of ways. For example, a participating store can use a memory card reader/writer to read memory card 258 and give the individual a discount on a product.

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If the individual is deemed uncompliant, customized health management script program 60 goes to step 716 and displays instructions for the individual to follow in order to become compliant. In the last step 718, the individual's answers

62, device measurements 64, and compliance status are stored on memory card 258.

#### **SUMMARY, RAMIFICATIONS, AND SCOPE**

5 Although the above description contains many specificities, these should not be construed as limitations on the scope of the invention, but merely as illustrations of some of the presently preferred embodiments. It should be noted that  
10 different components of each of the described embodiments can be combined in many ways. For example, the memory card could be used with the interactive telephone system.

Therefore, the scope of the invention should be determined not by the examples given but by the appended claims and  
15 their legal equivalents.